EARTH-KIND® ENVIRONMENTAL LANDSCAPE MANAGEMENT

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Good healthy soil is crucial to the development and productivity of our roses. Healthy soil has the ability to produce healthy plants. Healthy plants are better able to withstand attack from disease and pests.

The public's demand for low maintenance "environmentally friendly" plants (and roses) is growing at an explosive pace as (a) more gardeners are becoming less willing to expose themselves and their families to pesticides, (b) city governments restrict landscape irrigation, (c) legislation restricts pesticide usage and (d) the costs associated with commercial fertilizers and rose care products skyrocket (Zlesak 2006). Thanks to work being done by Dr. Steve George and the Texas AgriLife Extension Service we are able to provide you with the most up-to-date developments in soil management. These techniques have been tested in more than 40 research plots throughout Texas, and in Ohio, Iowa, Kansas, Nebraska, Oregon, Louisiana, Florida, Kentucky, New York, Mississippi and Washington, D.C. Known as the EarthKind® Environmental Landscape Management System, this approach to landscape management has been scientifically proven to provide a low maintenance, healthy environment for growing roses and almost all other plants without regard to soil and/or environmental conditions.

The Earth-Kind Environmental Landscape Management System applies to the entire landscape and was created by horticulture specialists at Texas AgriLife Extension Service. It addresses, in a beautiful way, the four greatest environmental challenges facing today's American homeowners:

- Stewardship of precious water resources;
- The abuse and/or misuse of commercial fertilizers;
- The abuse and/or misuse of pesticides;
- The need to keep a very valuable natural resource (tree leaves and branches) in our landscapes and out of landfills - making room for more non-recyclable waste.

Today's gardeners face many horticultural challenges and, as a result, are becoming more demanding of how they manage their landscapes. Drought and above-normal temperatures have forced communities to limit irrigation during periods of severe plant stress. Additionally, in many areas of the country, salt levels have increased due to a decrease in available ground water supplies further limiting plant available water (Brady et al 2001). In addition to direct results of difficult environmental conditions, these stressors also increase the susceptibility of rose cultivars to insect and disease pressure.

Horticulturists typically recommend supplemental irrigation, applications of fertilizers and spraying of appropriate pesticides to improve plant performance or correct landscape problems. Unfortunately, when supplemental irrigation is not always available and in the face of increased costs for commercial synthetic fertilizers, consumers are showing a preference for more environmentally friendly landscape management techniques, eschewing the use of synthetic fertilizers and pesticides (Harp et al 2008).

Guiding Principals of Earth-Kind Landscape Management

The guiding principle upon which this revolutionary approach to landscape management is based is grounded on the philosophy that soil in our landscape beds, vegetable gardens and fruit plantings should be maintained in much the same way that Mother Nature sustains the soil in a mature hardwood forest. Mirroring what happens in nature, Earth-Kind Environmental Landscape Management is a compost and mulch only approach that uses soil native to the planting site. In most native soils, this approach will:

- Increase microbial and earthworm populations which loosen and aerate the soil and improve soil and plant health;
- Promote the development of root systems which are larger and healthier that will explore a greater volume of soil for water and nutrients;
- Eliminate the need for commercial synthetic or organic fertilizers;
- Reduce salt burn on leaf margins in areas with salty irrigation water;

- Greatly reduce the need for supplemental irrigation once plants are established; and
- Promote the development of a more vigorous plant, thereby increasing the plant's ability to withstand pest infestation and disease.

Research has shown that with this approach the soil need only be worked one time (at the initial planting) over the course of 15 years[1].

The Basics of Soil

Soil has two physical properties: it's texture and it's structure. Texture is what the soil is made of, including solid particles (soil and organic material), pore spaces (filled with either oxygen or water) and living organisms. Structure refers to how the soil particles are arranged.

From a structural standpoint, the ideal soil is one where soil particles are bound together into water stable granules. This type of structure allows ready penetration of plant roots, good aeration and rapid infiltration of water. The most common soil structures are flat sheets (commonly found in unimproved clays) and "brush piles" (commonly found in sand and loam soils). In soils with poor structure, like clay soils, plant growth is very poor due to lack of aeration and poor drainage.

Soil particles come in three sizes: (1) sand is the largest sized particles, (2) silt is intermediate in size and (3) clay is the smallest sized particles. The predominance of soil particles defines the soil type. The most common soil types are:

- **Sandy soils** are very well aerated, drain quickly and are easy to work. However this type of soil does not hold moisture and nutrients very well. Some types of sand have very limited amounts of organic matter making them very difficult to sustain plants.

- **Loam soils** are the ideal soil type and are a nice balance of sand, silt and clay particles. They are well aerated, have a good ratio of organic matter to soil particles and are easy to work. This type of soil holds plenty of moisture and nutrients. Loam soils have the best texture and structure for growing plants.

- **Clay soils** hold too much water leading to poor aeration in the root zone leading to the potential for root rot diseases. Clay soils typically are well supplied with nutrients but are low in organic matter. This type of soil is the most difficult soil type in terms of growing plants. Poorly aerated, highly alkaline clay soils have a debilitating effect and significantly decrease the ability of a rose to grow and tolerate pest attack. In hot summer months, many clay soils develop large cracks that expose the feeder roots of roses to air ultimately killing or damaging the exposed root system.

Residential development and the creation of subdivisions have greatly impacted the native soil throughout the country. Filler "trash" clay is commonly added on top of the native soil to raise the site grade above street level. In these situations homeowners may find that they only have one to two inches of topsoil and what is below that can be anything. In my yard, we have found bottles, wire, broken concrete, bricks and lumber.

Earth-Kind Soil Management Guidelines

Generally, plants really respond to well-drained soils. When building a new bed, Texas A&M recommends that gardeners first kill the grass and weeds with an application of a herbicide. Once the grass and weeds are dead, till them into the soil to a depth of six inches. This will add additional organic matter to the soil. Then follow the recommendations below for your particular soil type.

Sand & Loam Soils - Till three (3) inches of aged plant-derived compost into the native soil using a roto-tiller. Plant roses directly into the improved soil. (A raised bed is unnecessary because these types of soil structures have adequate drainage.)

Clay Soils - Till three (3) inches of expanded shale into the native soil. Then till three (3) inches of aged, plant-derived compost into the soil/expanded shale mixture. You will end up with an area that is six (6) inches higher than the surrounding grade. Crown the bed (make it higher in the center than at the outer edges) and plant

1 Earth-Kind Environmental Landscape Management has been scientifically tested in research and field trials for 15 years. Researchers hypothesize that as long as the home gardener continues to maintain their landscape beds following the Earth-Kind Soil Management Guidelines, which includes maintaining a minimum 3-inch layer of shredded plant-derived mulch material, the soil will *never* have to be worked after the initial planting.

roses at the highest point in the beds.

Once the roses are planted, apply a 3-inch layer of shredded hardwood mulch completely across the top of the planting surface[2]. Add additional mulch as necessary in spring and fall to bring the mulch layer back to a full 3 inches. As the mulch decomposes into humus, it acts as a slow release long-term fertilizer providing additional nutrients to the soil, eliminating the need for applications of commercial synthetic fertilizers.

The Use of Expanded Shale in Heavy Clay Soils

Perhaps one of the most exciting developments resulting from Earth-Kind research has been in the use of expanded shale to open up the network of pores in heavy sticky clay soils. Expanded shale incorporated into native clay soils (prepared as explained above) *immediately* opens the structure of the soil and creates larger pores through which water and air can travel more easily - greatly improving the drainage ability of the soil.

Shale is a naturally occurring rock that is mined in many parts of the United States. To "expand" shale, producers heat the rock in great ovens until they "pop" into smaller size pieces. Researchers have tested several sizes of expanded shale and found that the intermediate sized particles (about the size of cat litter) perform best to break down heavy sticky clays[3].

Some ask, "Can't I just add pea gravel?" The answer is a resounding "No." Unlike pea gravel and other sedimentary/volcanic rocks and minerals, expanded shale is porous with hundreds of microscopic funnel-shaped shafts into which water, nutrients and air infiltrate. Particles of expanded shale should feel slightly rough and "gritty" as opposed to slick and shiny. Slick and shiny particles (offered by some suppliers) have been heated to such extreme temperatures that their surface melts and become glassy - which very well may have destroyed the open pore spaces within the shale particles.

In order to be effective, expanded shale must be tilled into the soil profile to a 6-inch depth. The depth of incorporation is important as most plants have feeder roots within 6 inches of the soil surface. For this reason, it is important to incorporate expanded shale when beds are initially prepared (before planting). It is usually not practical (or possible) to fully integrate expanded shale to established landscape beds (without removing the plant material).

Landscape beds containing *improved* clay soils that have become loose and friable as a result of regular soil amendments that are well drained and sandy/loam soils **do not need** expanded shale. These soil types have adequate drainage and aeration.

It is possible to break down heavy sticky clay soils without the addition of expanded shale by manually introducing organic matter to the soil over time. This approach can take three to five years to accomplish. The incorporation of expanded shale to improve this soil type is an *immediate* correction - making the soil drain better and providing more oxygen in the root zone of the plants.

Compost - A Gardener's Gold Mine

Compost incorporated into the soil provides an initial boost of nutrients to newly installed plants. There are many advantages to utilizing aged compost, including (a) it adds all-important organic matter to the soil, (b) it is very high in beneficial microorganisms, (c) it provides a source of plant nutrients, (d) it is inexpensive, and (e) it is locally available. In truly aged compost, the materials should be decomposed to the extent that their original form is no longer discernable.

Compost should be fully finished (aged) before incorporating it into the soil. Partially raw (unfinished) bagged compost can have droplets of moisture inside the bag. In bulk form, unfinished compost piles can smoke and will feel hot to the touch. Gardeners who must deal with partially raw (unfinished) compost should:

- Till the unfinished compost into the soil and wait

2 In arid desert areas increase the mulch layer to a minimum of 4 inches and run a drip irrigation system through the center of the mulch layer (as opposed to the top of the mulch or soil surface).

3 Researchers have tested expanded shale produced by Texas Industries, Inc. (distributed by Harvest Supply, Diamond Pro and TruGrow). Similar products may be sold in other states; however we make no recommendation regarding these other products because experts at Texas AgriLife Extension Service have not tested them.

at least three months before planting. This is the recommended method.

- Till the unfinished compost into the soil along with an additional nitrogen source (e.g. blood meal) and plant immediately.
- Form the organic material into a pile, add a slow-release, nitrogen-only fertilizer (e.g. blood meal, 24-0-0, etc.), moisten the pile and then turn the pile every two weeks until the material is fully composted.

Mulch Matters!

The importance of mulch to soil health cannot be over-emphasized. By definition, "mulch" is a blanket or layer of material applied so as to completely cover the soil surface (versus a soil amendment which is worked into the soil). Any high carbon, low nitrogen material (e.g. wood or paper) worked into the soil should first be fully composted, however, a much, which is applied only to the soil surface, can be completely raw. The advantages of utilizing an organic mulch include:

- The decomposition of mulch acts as a long-lasting, slow-release fertilizer;
- Promoting earthworm activity;
- Increased activity of beneficial soil microorganisms;
- Increased moisture retention in the soil;
- A reduction of soil temperature during summer months;
- Insulation of the soil and root zones of plants during winter;
- Reduces annual weeds by 90%, and
- It makes gardens more attractive.

The best mulches are those obtained locally which contain shredded tree limbs and green leaves. It is the green leaves that provide an important nitrogen source for decomposition and prevents depletion of nitrogen from the soil. Optimally, a raw mulch from tree-trimming operations is the cheapest and most readily available form of mulch in most communities. Utilizing these materials as mulch keeps them out of already overburdened landfills - a tremendous environmental victory!

A medium to coarsely shredded form of mulch is best. Bagged mulches derived from native hardwood trees decompose slower than mulches from tree trimming operations and are also acceptable. Mulches made from Cypress and Bois d'Arc trees decompose too slowly and are, therefore, not recommended.

If the materials used for mulch are obtained locally, the probability is high that local soil microbes will have the enzymes needed to efficiently decompose tissue from local tree species. During the slow decomposition process, soil microbes release nutrients from the mulch into the soil, making the mulch, in effect, a slow-release fertilizer. The decomposing mulch will also attract earthworms, which, by burrowing, loosen the soil, thereby improving aeration and increasing the oxygen content and drainage ability of the soil. The loosened soil will allow the plants to develop larger, healthier root systems. This "living mulch" replaces the organic matter (and compost) in the soil that is oxidized and lost each year.

In most areas, a 3-inch layer of mulch is adequate. For desert areas, a 4-inch layer of mulch is recommended. Top dress beds with additional mulch as necessary in spring and fall to bring the mulch layer back to a full 3 (or 4) inches.

Be Water Wise

Drip irrigation is, by far, the most efficient moisture delivery system for home landscapes. Supplemental irrigation should be supplied when the soil in the root ball is dry to the touch at a depth of 1 inch. Water thoroughly until there is moisture in the soil profile 6 inches deep.

No Fertilizer Necessary

In most soils, the Earth-Kind approach does not include the addition of any chemical or organic fertilizers. Compost worked into the soil prior to planting acts as the initial boost of nutrients. Thereafter, the continued and gradual decomposition of the mulch layer will act as a super-slow-release fertilizer, reintroducing nutrients back into the soil. With implementation of the Earth-Kind Environmental Landscape Management System coupled with Earth-Kind plant materials (other than perhaps in desert areas) no additional applications of fertilizer should be necessary[4].

4 Turf grasses may require 1 to 4 applications of a slow release fertilizer during the growing season depending on the turf grass being grown and the type of soil it is growing in.

Test the Water Retention of Your Soil

It is important to know whether your soil holds too much or not enough water. If your soil is at either extreme, it's texture and possibly it's structure, may need modification to ensure good plant health. To test the water retention of your garden soil:

1. Fill a gallon clay pot with soil.
2. Fill a glass quart jar with 1/2 pint (8 oz) of water. Identify the water level by marking "25%" with a magic marker on the outside of the jar at the water level.
3. Empty the water from the jar. Repeat the process by pouring 1 pint (16 oz) of water into the jar and mark the water level with "50%".
4. Empty the water from the jar. Repeat the process by pouring 1 1/2 pint (24 oz) of water into the jar and mark the water level with "75%". Empty the water from the jar.
5. Place the clay pot filled with soil over the empty marked quart jar. Slowly pour a quart of water into the clay pot.
6. At the end of 1 hour measure the amount of water in the marked quart jar.
7. Subtract the percentage of water in the jar from 100%.
8. Water retention should be 50 to 60% (40% to 50% of the water poured in the clay pot ended up in the quart jar).

Soils whose water retention is below 50% will benefit from the addition of organic matter (e.g. humus, compost). Soils retaining too much water need improvements in drainage and aeration (e.g. the addition of expanded shale, raising the planting surface, etc.)

Test the Drainage Capability of Your Soil

Roses hate having "wet feet". Too much water in the root zone of roses (or any plants) leads to poor aeration and ultimately rotted roots. This easy test will determine whether the drainage capabilities of your soil needs modification:

1. Cut the end out of a coffee can
2. Push the can down into moderately moist soil about 1 inch deep
3. Fill the can with water.
4. If it takes more than 1 hour for the water to disappear consider taking steps to improve drainage by incorporating expanded shale into the soil.
5. If the water disappears too quickly, add organic matter in the form of aged compost to the soil.

Why Earth-Kind?

The Earth-Kind philosophy is based on the premise that it is possible to identify beautiful plants that tolerate harsh low maintenance environments without fertilizers, pesticides and other agricultural chemicals and without excessive use of irrigation. It is the most popular and fastest growing, research-based, peer reviewed environmental university program of its kind in the nation with testing of Earth-Kind roses using Earth-Kind Environmental Landscape Management practices currently underway at seven universities, in addition to the Texas A&M Experiment and Research Station in Dallas, Texas. Participating universities include Colorado State University, the University of Minnesota, Louisiana State University, University of Nebraska-Lincoln and Texas A&M-Commerce.

As additional research studies are added (studying the effects of treated wastewater and saline irrigation water; perennials; shrubs and turf grasses) it is our hope that homeowners will have available to them a complete landscaping package of products and plant materials that are backed by years of rigorous scientific research and a proven track record of top performance regardless of environmental influences.